

# PATENT SPECIFICATION

(11) 1 493 202

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- (21) Application No. 5310/75 (22) Filed 7 Feb. 1975  
 (31) Convention Application No. 440931  
 (32) Filed 8 Feb. 1974 in  
 (33) United States of America (US)  
 (44) Complete Specification published 30 Nov. 1977  
 (51) INT CL<sup>2</sup> D06M 15/10  
 (52) Index at acceptance

D1P 21Y 387 391 39Y 400 581 584 587 610 641 65Y 660 66Y 681  
 70Y 744 74Y A18 B6 C2A12A10 C2A4 C2C10 C2C16  
 C2C5 C2C9 L2

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## (54) FABRIC TREATMENT ARTICLES

(71) We, THE PROCTER & GAMBLE COMPANY, a Corporation organised and existing under the laws of the State of Ohio, United States of America, of 301 East Sixth Street, Cincinnati, Ohio 45202, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to an article of manufacture for providing anti-static and softening benefits to fabrics in an automatic dryer. More specifically, the article utilises certain ethoxylated materials in combination with a mixture of fatty glycerides to provide the necessary anti-static and softening benefits.

Treatment in an automatic fabric dryer has been shown to be an effective means for imparting desirable tactile properties to fabrics. For example, it is becoming common to soften fabrics in an automatic fabric dryer rather than during the rinse cycle of a laundering operation.

Fabric "softness" is an expression well-defined in the art and is usually understood to be that quality of the treated fabric whereby its handle or texture is smooth, pliable and fluffy to the touch. Various chemical compounds have long been known to possess the ability to soften fabrics during a laundering operation.

Fabric softness also connotes the absence of static "cling" in the fabrics, and the commonly used quaternary fabric softeners provide both softening and anti-static benefits when applied to fabrics. Indeed, with fabrics such as nylon and polyester, the user is more able to perceive and appreciate an anti-static benefit than a true softening benefit.

Cationic anti-static softening compounds and compositions designed for application to fabrics in an automatic dryer have been the subject of recent innovations. (See, for example,

U.S. Patents 3,632,396 and 3,686,025.) Other materials have been suggested for use as dryer-added fabric softeners; see, for example, U.S. Patent 3,676,199 and British Application No. 46455/74, (Serial No. 1,482,782). Included among these prior softening compositions are various glycerides in combination with oil-soluble, lower-ethoxylated surfactants. Triglyceride fabric treating agents are disclosed in U.S. Patent 3,785,973.

It has now been discovered that certain highly ethoxylated, hygroscopic materials can be applied to fabrics to provide an anti-static effect thereto. The ethoxylates herein are highly water-soluble and are not particularly useful anti-static agents when employed in common fashion in an aqueous rinse bath, inasmuch as they are easily removed from fabrics by rinsing. Accordingly, such ethoxylates have not been widely recognized for use as anti-stats in laundering operations. It has now been found that such highly ethoxylated materials provide useful anti-static effects when applied to fabrics in an automatic fabric dryer. Moreover, the ethoxylated anti-stats herein can be applied to fabrics in combination with glyceride mixtures particularly adapted for use as dryer-added fabric softeners.

The ethoxylated anti-stats herein are provided in combination with a dispensing means in the form of a flexible substrate, which releases a pre-determined, effective amount of the anti-stat onto fabrics in an automatic fabric dryer. Mixed fatty glycerides are included with the flexible substrate to soften the fabrics.

According to the invention there is provided an article of manufacture adapted for use in an automatic fabric dryer, comprising

(a) a fabric treating composition comprising

(i) a surfactant for controlling static, of formula



- wherein R is a primary or secondary branched or unbranched alkyl or alkenyl moiety or a primary or secondary branched or unbranched alkyl- or alkenyl-substituted phenolic moiety; said moieties each having from 6 to 20 carbon atoms in the alkyl or alkenyl group, and wherein x is at least 20,
- (ii) a fabric softener comprising a mixture of mono-, di- and tri-glycerides of C<sub>12-18</sub> fatty acids, said mixture containing less than 30% by weight of soap and having a melting point of not less than 40°C, and

- (b) a flexible substrate in releasable combination with said fabric treating composition.

During use of the article of the present invention, damp fabrics are contacted with the article in an automatic fabric dryer. The heat and tumbling action of the dryer serves to disperse the anti-static agent evenly over all fabric surfaces, while concurrently drying the fabrics. The moisture originally present in the damp fabrics aids in achieving a uniform dispersion of the anti-static agent. On removal from the dryer, the hygroscopic nature of the anti-static agent causes a minute quantity of atmospheric moisture to be immediately adsorbed on the fabric surfaces and an anti-static effect is achieved.

The anti-static agents herein which are employed in combination with fabric softeners are more fully described hereinafter.

#### 35 Ethoxylated Anti-Stats

The dryer-added fabric treating composition used in the article of the invention includes an ethoxylated surfactant. While not intending to be limited by theory, it appears that the tactilely imperceptible amount of moisture sorbed by the hygroscopic anti-stats is sufficient to raise the surface conductivity of fabrics treated therewith by a factor of a million-fold, or greater. This increased surface conductivity serves to dispel the undesired static electrical charges in a rapid and efficient manner.

The ethoxylated anti-static agents herein are those materials which fall in the general class of hygroscopic ethoxylated surfactants. A listing of such hygroscopic, highly ethoxylated surfactants now found to be useful as through-the-dryer anti-stats appears in McCutcheon's "Detergents and Emulsifiers" North American Edition, 1973 Annual.

Hygroscopic surfactants which are employed as anti-static agents in the article of this invention are the nonionic ethoxylates of the general formula



where R is a primary, or secondary, branched

or unbranched alkyl or alkenyl moiety; a primary or secondary branched or unbranched alkyl- or alkenyl-substituted phenolic moiety; said moieties each having from 6 to 20 carbon atoms in the alkyl or alkenyl group, preferably 10 to 18 carbon atoms. In the general formula for the ethoxylated nonionic anti-stats herein, x is an integer of at least 20, preferably 25 to 100, most preferably 35 to 50.

Specific examples of the hygroscopic surfactants useful as the anti-stats in the article this invention are as follows. The examples are only by way of exemplification, and are not intended to be limiting of such materials.

#### Straight-Chain, Primary Alcohol Ethoxylates

The hygroscopic ethoxylates of hexa-, hepta-, octa-, nona-, deca-, undeca-, dodeca-, tetradeca-, hexadeca- and octadeca-alcohols condensed with at least 20 moles of ethylene oxide are useful herein. Exemplary ethoxylates of primary alcohols include n-C<sub>10</sub>EO(30), n-C<sub>12</sub>EO(40) and n-C<sub>16</sub>EO(50). The higher ethoxylates of mixed natural or synthetic alcohols in the "coconut" and "tallow" chain length range are also useful herein. Specific examples of such materials include coconutalkyl EO(45) and tallowalkyl EO(45).

#### Straight-Chain, Secondary Alcohol Ethoxylates

The hygroscopic ethoxylates of 2 - decanol, 2 - tetradecanol, 3 - hexadecanol, 2 - octadecanol, 4 - eicosanol, and 5 - eicosanol are useful anti-static agents in the context of this invention. Exemplary ethoxylated secondary alcohols useful herein as the anti-static agent are: 2-C<sub>10</sub>EO(40), 2-C<sub>12</sub>EO(45), 2-C<sub>14</sub>EO(60), 2-C<sub>16</sub>EO(60), 4-C<sub>20</sub>EO(80), 2-C<sub>16</sub>EO(100) and 2-C<sub>10</sub>EO(20). Commercial mixtures of secondary alcohols having an average hydrocarbyl chain length of 8 to 20 carbon atoms condensed with an average of 20-100 moles of ethylene oxide per mole of alcohol are also useful herein.

#### Alkyl Phenolic Ethoxylates

As in the case of alcohol ethoxylates, the hygroscopic ethoxylates of alkylphenols, particularly monohydric alkylphenols, are useful as the anti-static agent in the present invention. The EO<sub>20</sub>-EO<sub>100</sub> ethoxylates of commercially available alkyl phenols such as p - octyl phenol and p - nonyl phenol are readily prepared by well known condensation reactions.

Exemplary ethoxylated alkyl phenols useful as the anti-static agent herein are: p - octylphenol EO(45), p - nonylphenol EO(45) and p - decylphenol EO(40).

#### Olefinic Ethoxylates

The alkenyl alcohols, both primary and

secondary, and alkenyl phenols corresponding to those disclosed immediately hereinabove, can be ethoxylated with from 20 to 100 moles of ethylene oxide and thereby rendered hygroscopic and useful as the anti-static agent herein. Exemplary alkenyl ethoxylates herein include 2 - n - dodecenol EO(60), 3 - n - tetradecenol EO(30), p - (2 - nonexyl)phenol EO(40) and 2 - tetradecen - 4 - ol EO(45).

#### 10 Branched Chain Ethoxylates

Branched chain primary and secondary alcohols are available from the well known "OXO" (Registered Trade Mark) process and can be ethoxylated and employed as the anti-static agents herein. Exemplary branched-chain alkoxyates are as follows: 2 - methyl - 1 - dodecanol EO(60); 3 - ethyl - 2 - tetradecanol EO(100); and 2 - methyl 1 - hexadecanol EO(35).

20 As can be seen by the foregoing, a wide variety of hygroscopic ethoxylated nonionic surfactants are useful as the anti-static agent herein. It will be recognized that the designation of the degree of ethoxylation of the listed compounds is an average value, and commercial materials contain mixtures of hydrocarbyl materials having differing degrees of ethoxylation centering around an average value.

30 The preferred ethoxylates herein are the EO<sub>35</sub> to EO<sub>50</sub> ethoxylates of mixed tallow alcohols and mixed coconut alcohols. These commercially available materials are highly hygroscopic and quite effective anti-statics when employed in the manner of this invention. Coconutalkyl EO(45) and tallowalkyl EO(45) are especially preferred mixed alcohol ethoxylates for use herein. Lauryl EO(45) is also especially preferred herein.

#### 40 Glyceride Softener

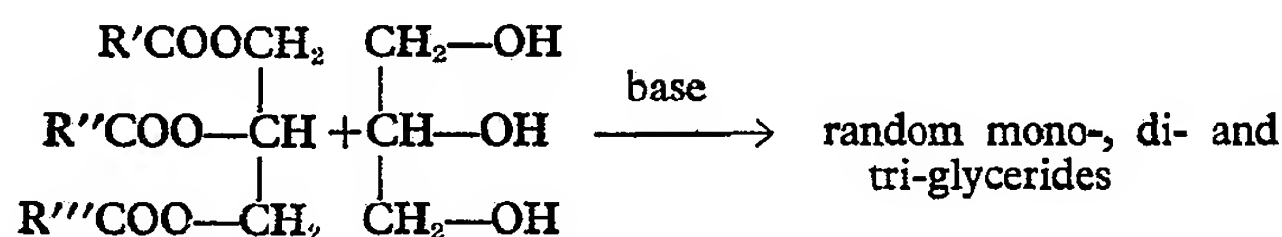
The anti-static agents herein are formulated in combination with mixtures of glycerides

and glyceride-fatty alcohol mixtures which provide a fabric softening aspect to the compositions herein. The glyceride and mixed glyceride-alcohol softeners herein are selected from materials which are solid at temperatures of 40°C or below, but which preferably soften and flow at automatic dryer operating temperatures, i.e., 50°C to 100°C.

The glyceride softeners herein comprise mixtures of monoglycerides, diglycerides and triglycerides of C<sub>12</sub>—C<sub>18</sub> fatty acids having a melting point range preferably of from 50°C to about 100°C, preferably from about 60°C to about 95°C. Of course, such mixtures do not melt sharply, but gradually soften and flow over a range of temperatures. The flow properties of the glyceride softeners provide even distribution onto fabrics in an automatic dryer. By employing glyceride mixtures having a melting point falling within the stated range, a non-greasy fabric softening effect is secured.

The glyceride mixtures herein can be prepared by admixing pure mono-, di- and triglycerides in the relative ratios and proportions disclosed hereinafter to provide mixed compositions which provide a soft, lubricious feel on fabrics. While the individual triglycerides are readily available from natural sources, it is much more difficult to isolate the pure mono- and di-glyceride components, so that such a mixing procedure is not a commercially attractive means for preparing the glyceride mixtures used herein.

Glyceride mixtures of the type useful herein can be more conveniently prepared from natural or synthetic triglycerides by means of a trans-esterification reaction employing glycerine and a base. Such trans-esterification reactions take place in well-known fashion to provide random mixtures of mono-, di- and tri-glycerides, according to the following reaction:



In the equation, groups R', R'' and R''' are C<sub>10</sub>—C<sub>22</sub> alkyl and alkenyl. By selecting the appropriate molar ratios of reactants, it is possible to prepare glyceride mixtures having the desired relative ratios of the mono-, di- and tri-glyceride components.

The trans-esterification reaction takes place by the random migration of the fatty acid groups on the glycerol molecule. Thus, the acyl moieties can be found in random positions on the glycerol moiety at the completion of the reaction. This randomization of acyl groups is immaterial from the standpoint of the instant invention, insofar as the randomized

glycerides have the appropriate melting point ranges for use herein.

In the trans-esterification, the presence of excessive amounts of base, especially the alkali metal hydroxides, can result in the formation of various amounts of soaps, i.e., the sodium salts of the migrating fatty acids. It has been determined that glyceride mixtures containing greater than about 20% by weight of fatty acid soaps are useful as fabric softeners. However, the presence of such soaps prevents the efficient and complete removal of the glyceride mixtures from the flexible substrate dispensing means used herein during the average time



of a drying cycle. Accordingly, it is necessary to employ glyceride mixtures containing less than 30% by weight of soap when such dispensing means are employed. In order to provide glyceride mixtures containing such minimal amounts of soap, the ratio of sodium hydroxide used in the trans-esterification reaction is simply adjusted so that the combined moles of triglyceride and glycerine is at least about 5 times, preferably at least 5.6 times, that of the base. Alternatively, excess soap can be removed by aqueous washing processes.

The melting point of the glyceride mixtures employed herein depends both on the ratio of the mono-, di- and tri-glyceride components present therein and on the chain lengths of the fatty acids which make up the various glyceride esters. Preferably, glyceride mixtures containing from about 30% to about 90%, preferably 40% to about 90% by weight of  $C_{12}$  to  $C_{18}$  monoglycerides; from about 15% to about 60%, preferably 15% to about 50% by weight of  $C_{12}$  to  $C_{18}$  diglycerides; and from about 1% to about 15%, preferably 1% to about 5%, of  $C_{12}$  to  $C_{18}$  triglycerides are useful herein. Such mixtures also comprise complex trans-esterification reaction by-products, including soaps and free fatty acids.

The foregoing glyceride mixtures are most conveniently prepared by selecting as the precursor material, a triglyceride which, itself, contains substantial amounts of  $C_{12}$  to  $C_{18}$  esterified acid groups. It is well recognized in the art that certain animal and vegetable fats and oils are comprised mainly of the glyceride esters of the longer-chain fatty acids, whereas other natural triglycerides comprise major amounts of the esters of relatively shorter-chain acids. For example, peanut oil contains up to about 70% by weight of  $C_{18}$  fatty acids, with soybean oil, cottonseed oil and lard containing equal, or even greater percentages of the long-chain fatty acids. Moreover, it is recognized that the long-chain fatty acids present in these naturally-occurring glycerides often contain points of unsaturation. The natural glycerides can, in general, be hydrogenated at these points of unsaturation to provide materials which have even higher melting points than the natural materials. It is preferred herein to select such naturally-occurring, high-melting and hydrogenated high-melting triglycerides for use herein as the precursor materials for preparing the mixtures of mono-, di- and tri-glycerides by means of the foregoing transesterification reaction.

When using the natural triglycerides as precursors for the glyceride mixtures herein, it will be recognized that up to about 30% by weight of the total fatty acids will be  $C_{12}$ , and shorter, in chain length. The presence of such shorter chain materials is immaterial, so long as the overall melting point range is obtained.

Preferred precursor materials for the glyceride mixtures herein include lard, winterized lard, tallow, hydrogenated (hardened) tallow, hydrogenated (hardened) soybean oil, and hydrogenated (hardened) peanut oil. Any of these materials can be transesterified in the presence of glycerine and base in well-known fashion to provide the glyceride mixtures useful herein.

Inasmuch as the trans-esterification reaction herein proceeds with a random migration of acyl groups, it is not possible to fully characterize the mixed glyceride reaction products except in terms of melting point and amounts of free soap. It is within the purview of the user to select reaction conditions which will result in the desired melting point range and free soap content of the glyceride mixtures.

Especially preferred glyceride mixtures herein comprise the trans-esterified reaction product of hardened tallow fat, glycerine and sodium hydroxide and the trans-esterified reaction product of hardened soybean oil, glycerine and sodium hydroxide having the melting point range set forth above.

A highly preferred glyceride mixture herein comprises the trans-esterified reaction product of hardened tallow fat in a 3 to 10 molar proportion, glycerine in a 2 to 4 molar proportion and sodium hydroxide in a 0.5 to 1.5 molar proportion. Another highly preferred glyceride mixture herein comprises the trans-esterified reaction product of hardened soybean oil in a 3 to 10 molar proportion, glycerine in a 2 to 4 molar proportion and sodium hydroxide in a 0.5 to 1.5 molar proportion.

The glyceride mixtures can be employed herein singly as the optional fabric softening agent, or can be blended with a  $C_{10}$ — $C_{20}$  fatty alcohol which advantageously modifies the softening properties thereof. The pure fatty alcohols can be employed in combination with the glycerides, but it is more preferred from an economic standpoint to use alcohol mixtures, such as the common fatty alcohol mixtures prepared from coconut and tallow triglycerides. Especially preferred alcohols herein fall within the tallowalkyl range, with the most preferred mixtures being "higher" tallowalkyl alcohols, i.e., those having little or no  $C_{12}$  lower melting alcohols.

Preferred fabric softeners herein comprise glyceride mixtures of the type disclosed hereinabove in combination with alcohols at a weight ratio of glyceride:alcohol of from about 7:3 to about 9:1.

#### Dispensing Means

The anti-static and mixed anti-static/softening compositions herein are employed in combination with a dispensing means in the form of a flexible substrate which evenly distributes the compositions onto fabrics under the heating and tumbling action of an automatic dryer.

Such dispensing means can be designed for single usage or for multiple uses.

One such article comprises a sponge material releasably holding enough of the composition to effectively impart anti-static, or mixed anti-static and softening, benefits to fabrics during several cycles of clothes. This multi-use article can be made by filling a hollow sponge with about 20 grams of the present compositions. In use, a portion of the composition melts and leaches through the pores of the sponge onto the fabrics in a uniform manner. Such a filled sponge can be used to treat several loads of fabrics in conventional dryers, and has the advantage that it can remain in the dryer after use and is not likely to be misplaced or lost.

Another article comprises a cloth or paper bag releasably enclosing the composition and sealed with hardened plug of the composition. The heat of the dryer opens the bag and releases the fabric treating composition therein.

A highly preferred article herein comprises the fabric treating composition releasably sorbed on, or otherwise affixed to, a flexible paper or woven or non-woven cloth substrate such that the reaction of the automatic dryer removes the fabric treating composition and deposits it on the fabrics. Such flexible substrates are most conveniently provided in a sheet configuration.

The sheet configuration has several advantages. First, effective amounts of the fabric treating compositions for use in conventional dryers can be easily affixed to the substrate by a simple dipping or padding process. Additionally, the relatively flat, thin coating of the fabric treating composition on the sheet is effectively and thoroughly released onto the fabrics which come in contact therewith. Sheets can be easily made which contain a pre-determined amount of the fabric treating composition sufficient to treat a standard (5 lbs.—10 lbs.) dryer load, such that the user need not measure the amount of composition necessary to treat the fabrics.

More specifically, the water-insoluble paper, or woven or non-woven substrates used in the preferred articles herein can have a dense, or more preferably, open or porous structure. Examples of suitable materials which can be used as substrates herein include paper, woven cloth, and non-woven cloth. The term "cloth" herein means a woven or non-woven substrate for the articles of manufacture, as distinguished from the term "fabric" which encompasses the clothing fabrics being dried in an automatic dryer.

The paper, woven or non-woven substrates useful herein are fully disclosed in U.S. Patent 3,632,396.

As noted above, the preferred sheeted articles herein can be manufactured by a simple dipping or coating procedure. In a typical procedure, the hygroscopic anti-stat

softener composition in the form of a fluid melt, is simply padded onto the sheet. The mixed anti-stat/softener compositions can be conveniently fashioned by homogenizing the glyceride softener mixture and the hygroscopic anti-static by warming in a trough to form a fluid melt. The insoluble substrate is fed through the melt and the composition coats and impregnates the substrate. The substrate is removed from the trough and the fabric treating composition solidifies on the substrate. By controlling the type of substrate and the speed of the substrate through the trough, an effective amount of the fabric treating composition is affixed to a predetermined length and width of substrate.

The preferred anti-static/softening articles herein are provided as 9 in. × 11 in. substrate sheets coated with from about 0.01 g. to about 1 g. of the hygroscopic anti-static agent and from about 1 g. to about 3 g. of the glyceride softener. This article provides an anti-static and softening effect to an average 5 lb. dryer load of damp fabrics.

A highly preferred anti-static/softening article herein comprises: (a) a fabric treating composition comprising (i) from 1 gram to 3 grams of a glyceride mixture consisting of the trans-esterified glyceride reaction product of a 3:1:2.6 molar mixture of glycerine, sodium hydroxide, and hardened soybean oil or hardened tallow, (ii) from 0.5 grams to 1.0 grams of mixed C<sub>12</sub> to C<sub>18</sub> fatty alcohols, and (iii) from 0.1 gram to 2 grams of a surfactant selected from the EO<sub>35</sub> to EO<sub>50</sub> ethoxylates of mixed tallow and mixed coconut alcohols; and (b) a flexible substrate of woven, non-woven and or paper sheets, to which said fabric treating composition is releasably affixed at a weight ratio of fabric treating composition to substrate of from 50:1 to 1:50.

#### Optional Components

The articles herein can employ minor proportions (i.e., usually about 0.1% to about 30% by weight of the fabric treating composition) of various optional ingredients which provide additional fabric conditioning benefits. Such optional ingredients include perfumes, optical brighteners, fumigants, bacteriocides, fungicides, and flame retardants. Specific examples of typical additives useful herein can be found in any current Year Book of the American Association of Textile Chemists and Colorists. Since the major proportion of the fabric treating compositions herein is nonionic, the compositions are compatible with all manner of such optional ingredients.

One type of optional ingredient herein includes the well known quaternary ammonium anti-static and fabric softening agents. While the hygroscopic anti-stats herein are quite effective for their intended use, minor proportions of quaternary salts can

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optionally be employed in combination therewith to provide an added increment of static control, as well as contributing to fabric softness. Specific examples of such quaternary salts include di - (tallowalkyl) - dimethylammonium chloride and di - (tallowalkyl) - dimethylammonium methylsulfate.

In the use of the article of the invention the anti-static agent in combination with the glyceride fabric softener, is used in an effective amount to condition fabrics in an automatic dryer. The effective, i.e., static-controlling, amount of the hygroscopic anti-static agent employed in the manner of this invention will depend somewhat on the type of fabric being treated and the dampness of the surrounding atmosphere. For example, it is well-known that under conditions of low humidity, static control in fabrics is somewhat more difficult to achieve than under conditions of high humidity. Accordingly, the amount of hygroscopic anti-stat employed can be adjusted, depending on the type of fabrics, conditions of humidity, and according to the desires of the user. For most purposes, the hygroscopic anti-stat is applied to fabrics at a rate of about 0.01 gram to about 2.0 grams, preferably 0.01—1.0 gram, per 5 lbs. of fabric.

The fabric softener glyceride and mixed glyceride/fatty alcohol compositions are also employed in an effective, i.e., fabric softening, amount in the processes and articles herein. The amount of softener can be varied according to fabric type, the desires of the user, etc. For most purposes, effective fabric softening is secured over a wide range of fabrics by applying the fabric softeners herein to fabrics at a rate of from about 1 gram to about 10 grams, most preferably about 2—3 grams, per 5 lbs. of fabric. Higher usage rates can be employed, if desired, but can result in an undesirable greasiness on the fabrics.

The process herein is carried out in the following manner. Damp fabrics, usually containing from about 1 to about 1.5 times their weight of water, are placed in the drum of an automatic clothes dryer. In practice, such damp fabrics are commonly obtained by laundering, rinsing and spin-drying the fabrics in a standard washing machine. The compositions herein are simply spread uniformly over all fabric surfaces, for example, by sprinkling the composition onto the fabrics from a shaker device. The dryer is then operated in a standard fashion to dry the fabrics, usually at a temperature from about 50°C to about 80°C for a period from about 10 minutes to about 60 minutes, depending on the fabric load and type. On removal from the dryer, the dried fabrics instantaneously sorb a minute quantity of water which quickly and effectively dissipates static charge.

In a preferred mode, the present process is carried out by fashioning an article comprising the dispensing means of the type herein-

above described in releasable combination with the compositions herein. This article is simply added to a clothes dryer together with the damp fabrics to be treated. The heat and tumbling action of the revolving dryer drum evenly distributes the composition over all fabric surfaces, and dries the fabrics.

The following example illustrates the present invention, but is not intended to be limiting thereof.

#### EXAMPLE

An article of manufacture comprising an anti-static fabric softening composition releasably affixed to a non-woven cloth substrate and adapted for use in an automatic dryer is as follows:

Composition		
Ingredient	Weight %	
Glyceride mixture*	75	
Tallowalkyl alcohols**	20	85
Lauryl alcohol ethoxylate (45)	5	

Substrate  
Non-woven rayon, 3-denier, ca. 11 inches wide.

\* Trans-esterified hardened tallow glycerides comprising monoglycerides, diglycerides, and triglycerides in a weight ratio of mono:di:tri, ca. 20:6:1, additionally containing complex mixtures of soaps, glycerine and diglycerol.

\*\* Mixture comprising ca 10% C<sub>14</sub>, 40% C<sub>16</sub>, 50% C<sub>18</sub> alcohols.

The cloth substrate is mounted on a tubular roll and a rod is passed through the core and positioned to allow the cloth to unroll when pulled.

The Composition is heated to ca. 70°C in a trough to provide a homogeneous melt. The substrate is pulled through the trough at a rate of about 50—60 feet per minute and further passed through a pair of rollers which are adjusted to remove excess molten Composition from the substrate.

The speed of the substrate passing through the trough and the pressure of the pair of rollers is adjusted to that 3—5 grams of the Composition are deposited per 110 in.<sup>2</sup> of substrate. The substrate is perforated every 10 inches to provide easy separation into sheets having 3—5 g. of the Composition on each sheet. The article is allowed to cool to room temperature, whereby the molten Composition solidifies. The final article remains flexible.

An article prepared in the foregoing manner having a total surface area (both sides) of 220 in.<sup>2</sup> is added to a home dryer containing 5 lbs. of wet clothes. The dryer is operated at an average temperature of 67°C to dry the fabrics. The fabrics are provided with a soft, anti-static finish.

The foregoing illustrates the commercial



advantage of the sheet substrates herein in that production speeds of 500—600 linear feet of substrate/minute, and greater, can be coated with the compositions herein. Moreover, the compositions do not foam. Foaming encountered in the preparation of dryer-added fabric treating articles employing high levels of quaternary ammonium salts, as disclosed in the prior art, can cause substantial processing problems in high speed production lines.

The Composition of the Example is modified by replacing one-tenth of the glyceride mixture with di - (tallowalkyl)dimethylammonium methylsulfate and equivalent results are secured.

#### WHAT WE CLAIM IS:—

1. An article of manufacture adapted for use in an automatic fabric dryer, comprising

(a) a fabric treating composition comprising

(i) a surfactant for controlling static, of formula



wherein R is a primary or secondary branched or unbranched alkyl or alkenyl moiety or a primary or secondary branched or unbranched alkyl- or alkenyl-substituted phenolic moiety; said moieties each having from 6 to 20 carbon atoms in the alkyl or alkenyl group, and wherein x is at least 20,

(ii) a fabric softener comprising a mixture of mono-, di- and tri-glycerides of  $C_{12-18}$  fatty acids, said mixture containing less than 30% by weight of soap and having a melting point of not less than 40°C, and

(b) a flexible substrate in releasable combination with said fabric treating composition.

2. An article according to claim 1 wherein x is an integer from 35—50.

3. An article according to claim 2 wherein the surfactant is coconut alkyl EO(45) or tallow alkyl EO(45).

4. An article according to any one of claims 1 to 3 wherein the fabric softener comprises the trans-esterified reaction product of hardened tallow, glycerine and sodium hydroxide.

5. An article according to any of claims 1 to 3 wherein the fabric softener comprises the trans-esterified reaction product of hardened soya bean oil, glycerine and sodium hydroxide.

6. An article according to any one of claims

1 to 5 wherein the glyceride mixture has a melting point of from 50 to 100°C.

7. An article according to any previous claim wherein the fabric softener comprises a mixture of said glycerides and  $C_{10-20}$  fatty alcohols in weight ratio from 7:3 to 9:1, the mixture having a melting point of not less than 40°.

8. An article according to claim 7 wherein the glyceride/fatty alcohol mixture has a melting point of from 50° to 100°C.

9. An article according to any previous claims wherein the flexible substrate consists of woven cloth, non-woven cloth or paper.

10. An article according to any previous claim wherein the flexible substrate is in sheet form.

11. An article according to any one of claims 7 to 10 comprising

(a) a fabric treating composition comprising

(i) from 1 gram to 3 grams of a glyceride mixture consisting of the trans-esterified glyceride reaction product of 3:1:2.6 molar mixture of glycerine, sodium hydroxide and hardened soya bean oil or hardened tallow,

(ii) from 0.5 grams to 1 gram of mixed  $C_{12}$  to  $C_{18}$  fatty alcohols, and

(iii) from 0.1 grams to 2 grams of a surfactant selected from the  $EO_{35}$  to  $EO_{60}$  ethoxylates of mixed tallow and mixed coconut alcohols, and

(b) A flexible substrate of woven, non-woven or paper sheets to which said fabric treating composition is releasably affixed at a weight ratio of fabric treating composition to substrate of from 50:1 to 1:50.

12. An article of manufacture adapted for use in an automatic fabric dryer substantially as hereinbefore described in the Example.

13. A process for imparting an anti-static effect to fabrics in an automatic fabric dryer which comprises co-mingling pieces of damp fabric by tumbling said fabrics under heat in the dryer with an article according to any one of claims 1 to 12.

14. A process according to claim 13 wherein the article provides from 0.01 grams to 1 gram of surfactant per 5 lbs. of fabric.

15. Fabrics whenever treated by a process according to claim 13 or 14.

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